TSWSF 18.5 V1

Kennedy/Jenks Consultants

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10 February 1994

Ms. Deborah Yamamoto
South Tacoma Field Site Manager
U.S. Environmental Protection Agency, Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Subject: Fourth Quarterly Groundwater Monitoring Report
Former Griffin Wheel Brass Foundry - Tacoma, Washington
Amsted Industries
K/J 926061.00

Dear Ms. Yamamoto:

In accordance with our agreement with Amsted Industries (Amsted) and the *Final Groundwater Monitoring Program Work Plan of February 1993* (Final Work Plan), Kennedy/Jenks Consultants is pleased to provide you with two (2) copies of this Fourth Quarterly Groundwater Monitoring Report, which presents the results of Kennedy/Jenks Consultants' September 1993 groundwater monitoring activities at Amsted's former brass foundry (Griffin Wheel Brass Foundry).

This letter report includes:

- A summary and description of monitoring activities performed at the former Griffin Wheel Brass Foundry site
- Water level elevations of onsite groundwater monitoring wells
- A brief discussion of local hydrogeology relative to other investigations performed at the former Griffin Wheel Brass Foundry site, including groundwater flow direction and contour map
- Observations of floating product

AR 2.4

- Groundwater sampling procedures and field parameters
- A summary of analytical results.

FIELD MONITORING ACTIVITIES

Kennedy/Jenks Consultants personnel performed the following groundwater monitoring activities at the former Griffin Wheel Brass Foundry site on 6 January 1994:

- Measured water levels in groundwater monitoring wells NMW-8, NMW-9, NMW-10, NMW-11, NMW-12, NMW-13, NMW-14, MW-1A, and MW-3A
- Inspected the monitoring wells (listed above) for the presence of floating product
- Recovered floating product from groundwater monitoring well NMW-13
- Collected groundwater samples from monitoring wells NMW-8, NMW-9, NMW-10, NMW-11, NMW-12, NMW-13, and NMW-14.

WATER LEVEL ELEVATIONS

Water level measurements were performed at groundwater monitoring wells NMW-8, NMW-9, NMW-10, NMW-11, NMW-12, NMW-13, NMW-14, MW-1A, and MW-3A. The locations of these wells are shown on Figure 1D (Attachment 1). Water level measurements were performed by procedures specified in the Final Work Plan. Water level elevations are presented in Table 1D (Attachment 2).

HYDROGEOLOGIC CONDITIONS

Groundwater elevations were contoured using PC TIN 3.4D and ARC/INFO 3.4D computer software. The contour map (Figure 1D - Attachment 1) shows the groundwater surface of onsite monitoring wells. The groundwater flow direction and gradient near the location of the former underground storage tank (UST) were estimated from the contour map.

Estimated flow directions and gradients for the fourth quarter varied significantly in the vicinity of the former UST from previous measurements. The estimated groundwater flow directions for the fourth quarter ranged from a northeast to southeast direction (north 43 degrees east to south 77 degrees east); the estimated groundwater gradients ranged rom 0.002 to 0.003 feet per foot (ft/ft). The estimated groundwater flow directions from previous measurements in 1993 were to the northwest. The groundwater gradients increased from previous measurements (0.0015 to 0.0020 ft/ft).

Hydrogeologic conditions appear consistent with previously calculated flow direction and gradient data, indicating seasonal variations as presented in the *Subsurface Investigation, Former Griffin Wheel Brass Foundry, South Tacoma Field Superfund Site, Tacoma, Washington*, dated December 1992, by Kennedy/Jenks Consultants.

OBSERVATION OF FLOATING PRODUCT

All onsite wells were monitored and visually inspected for the presence of floating product on the water table surface. The procedures for observing and monitoring all wells, except well NMW-13, entailed affixing an oil-absorbent material to a water level probe and placing the probe in the well at the groundwater surface. The absorbent

material was then visually inspected for the presence of floating product. Product was monitored in well NMW-13 using an oil/water interface probe. The actual thickness of product could not be determined due to the viscosity of the product.

Floating product was observed only in well NMW-13. The floating product was recovered from this well by affixing oil-absorbent material to a weighted string and placing the weighted string into the well at the groundwater surface. This procedure was repeated several times until no floating product was observed on the absorbent material. Floating product saturated the absorbent material during the initial three recovery procedures. Thereafter, the amount of floating product affixed to the absorbent material diminished with each subsequent application of this procedure.

GROUNDWATER SAMPLING

Groundwater samples were collected from wells NMW-8, NMW-9, NMW-10, NMW-11, NMW-12, NMW-13, and NMW-14 and analyzed for total petroleum hydrocarbons (TPH) by Washington State Method WTPH-D and for polynuclear aromatic hydrocarbons (PAHs) by U.S. Environmental Protection Agency (EPA) Method 8310.

Groundwater sampling was performed as specified in the Final Work Plan. Prior to purging and sampling the wells, the dedicated pumps were raised within the casing so that the top of the pump was within approximately 1 foot of the static water level.

Field parameters, including pH, temperature, and conductivity, were measured and recorded during the groundwater sampling event. The field parameters for this sampling event are summarized in Table 2D (Attachment 2). Groundwater purge and sampling forms are presented in Attachment 3.

One field duplicate sample and one field blank sample were collected during the fourth quarterly sampling event. The field duplicate blank sample was analyzed for the same analytes as the groundwater samples (TPH and PAHs). The field blank sample was analyzed for TPH. Analytical results are summarized in Table 3D (Attachment 2). Complete analytical results (including quality assurance data) are maintained in the project file and are available upon request.

SUMMARY OF ANALYTICAL RESULTS

Analytical data generated by the laboratory were reviewed to assess the laboratory's performance in meeting the quality control (QC) specifications for detection limits, accuracy, precision, and completeness. All QC criteria for the WTPH-D analysis (i.e., method blank and surrogate recoveries) were within the method control limits. In addition, all QC criteria for the PAH analysis (i.e., surrogate recoveries, matrix spike recoveries, relative percent differences, and method blank samples) were met.

Several noncarcinogenic PAH compounds were detected in the sample from monitoring well NMW-13. Concentrations of all detected compounds ranged from 0.093 to 0.56 μg/L. The detected compounds were similar to compounds detected in samples collected from well NMW-13 during previous sampling in September 1992, February, May, and September 1993. Concentrations detected during the fourth quarterly sampling event were slightly lower than concentrations detected during the previous sampling events. A comparison of compounds detected in samples from well NMW-13 for the five sampling events is shown in Table 4D (Attachment 2). PAHs were not detected in any of the other samples collected from the groundwater monitoring wells.

TPHs were detected in the sample collected from monitoring well NMW-13 at a concentration of 0.49 mg/L. This concentration is slightly lower than concentrations

previously detected in samples collected from this well. TPHs were detected in the samples collected from well NMW-13 during the second and third quarterly sampling events at concentrations of 0.95 and 1.0 mg/L, respectively. TPHs were detected in the sample collected from well NMW-13 during the first quarterly event at a concentration of 0.7 mg/L.

TPHs were not detected in any of the other samples collected from the monitoring wells during the fourth quarterly event. TPHs were previously detected in samples collected from monitoring well NMW-9 during the second and third quarterly events at concentrations of 0.28 and 0.32, respectively. TPHs were not detected (at a detection limit of 0.3 mg/L) in the sample from well NMW-9 during the first quarterly sampling event. The detection limit for TPH at NMW-9 during the fourth quarterly event was 0.25 mg/L.

TPHs were not detected in any of the samples collected from the monitoring wells during the September 1992 sampling event. However, groundwater samples collected in September 1992 were analyzed for TPH by Washington State Method WTPH-418.1. (Groundwater samples collected during the first, second, third, and fourth quarters of groundwater sampling were analyzed for TPH by Washington State Method WTPH-D.) TPHs were not detected in any of the other sampled groundwater monitoring wells.

This fourth quarterly sampling event and report completes the quarterly groundwater monitoring program outlined in our Final Work Plan dated February 1993 for groundwater monitoring at the former Griffin Wheel Brass Foundry.

Please contact us at (206) 874-0555 if you have any questions regarding the information presented herein.

Very truly yours,

KENNEDY/JENKS CONSULTANTS

Julie A. Reid, CHMM
Project Engineer

Nathan A. Graves
Vice President

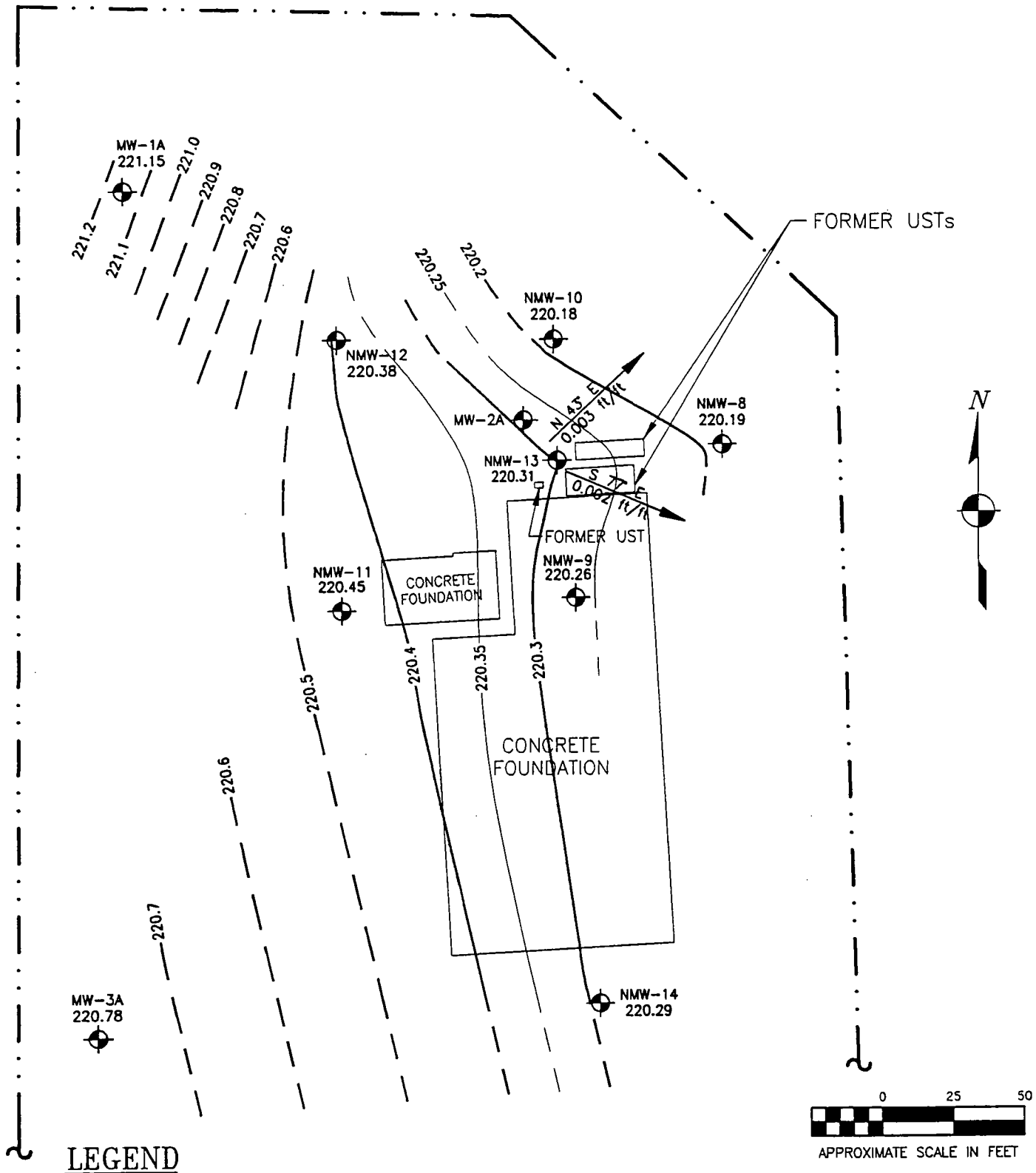
JAR/NAG:nmh
2jar1

Attachment

cc: Edward Brosius, Amsted Industries (w/att.)
Bill Joyce, Ogden Murphy & Wallace (w/att.)
John Frerich, ICF Technology, Inc. (w/att.)
Chris Poindexter, Washington State Department of Ecology (w/att.)

Attachment 1

Figure



LEGEND

- MW-3A 220.78 — MONITORING WELL LOCATION AND WATER LEVEL ELEVATION (FEET ABOVE MSL)
- APPROXIMATE PIEZOMETRIC SURFACE ELEVATION CONTOURS (FEET ABOVE MSL) (0.1 FOOT CONTOUR INTERVAL)
- APPROXIMATE PIEZOMETRIC SURFACE ELEVATION CONTOURS (FEET ABOVE MSL) (0.05 FOOT CONTOUR INTERVAL)
- INFERRED POTENTIOMETRIC SURFACE ELEVATION CONTOURS (FEET ABOVE MSL)

Kennedy/Jenks Consultants

AMSTED INDUSTRIES
TACOMA, WA

ESTIMATED POTENTIOMETRIC SURFACE JANUARY 1994

926061.00/P4SK001

FIGURE 1D

Attachment 2

Tables

TABLE 1D[a]

GROUNDWATER LEVEL MEASUREMENTS
FOURTH QUARTER - JANUARY MONITORING EVENT
Former Griffin Wheel Brass Foundry

Well No.	Location No.	Top of Monument Elevation (ft)[b]	Depth of Water (ft)[c]	Water Level Elevation (ft)
NMW-8	1789	252.94	32.75	220.19
NMW-9	1790	253.79	33.53	220.26
NMW-10	1791	253.49	33.31	220.18
NMW-11	1792	252.28	31.83	220.45
NMW-12	1793	252.49	32.11	220.38
NMW-13	1794	252.76	32.45	220.31
NMW-14	1795	249.34	29.05	220.29
MW-1A	1773	243.62	22.47	221.15
MW-3A	1775	240.64	19.86	220.78

Notes:

(a) Tables in the Quarterly Groundwater Monitoring Report will be labeled A for the first quarter, B for the second quarter, C for the third quarter, and D for the fourth quarter to differentiate between the four quarters of groundwater monitoring.
(b) Elevations are given in feet and are based on City of Tacoma vertical datum.
(c) Depth to water is measured from top of the steel well monument.

TABLE 2D

SUMMARY OF GROUNDWATER MONITORING ACTIVITIES
FOURTH QUARTER - JANUARY MONITORING EVENT
Former Griffin Wheel Brass Foundry

Well Number	Sample Identification	Date	Time	Water Depth[a] (feet)	Product Observed	Sampling Method[b]	Duration of Purge (Minutes)	Water Volume Removed (gallons)	Well Volumes Removed	Conductivity (µmhos/cm)	pH (units)	Temperature (° Celsius)	Relative Turbidity/Color[c]	Well Dewatered
NMW-8	1789GU000000000.013	01/06/94	1220	32.75	No	Sub. Pump	23	6.0	3.3	192	6.42	12.1	Clear	No
NMW-9	1790GU000000000.013	01/06/94	1330	33.53	No	Sub. Pump	45	25	3.5	271	6.22	12.3	Clear	No
NMW-10	1791GU000000000.013	01/06/94	1040	33.31	No	Sub. Pump	25	5.5	3.1	201	6.30	11.9	Slight/Brown	No
NMW-11	1792GU000000000.013	01/06/94	1125	31.83	No	Sub. Pump	25	7.5	3.1	563	6.69	12.0	Slight/Brown	No
NMW-12	1793GU000000000.013	01/06/94	1005	32.11	No	Sub. Pump	22	6.0	3.1	252	6.23	11.4	Clear	No
NMW-13	1794GU201000000.013 2003GU202000000.013[d]	01/06/94	1500	32.45	Yes	Sub. Pump	59	55	3.3	278	6.30	12.8	Clear	No
NMW-14	1795GU000000000.013	01/06/94	0915	29.05	No	Sub. Pump	28	8.0	3.3	226	6.67	11.8	Clear	No
MW-1	NS[e]	01/06/94	1200	22.47	No	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-3	NS	01/06/94	1105	19.86	No	NS	NS	NS	NS	NS	NS	NS	NS	NS

Notes:

(a) Depth measured from top of well monument.
(b) All wells were sampled with a submersible pump.
(c) Relative turbidity was determined through visual observation.
(d) A duplicate groundwater sample was collected at well NMW-13.
(e) NS - Not sampled. The water levels of monitoring wells MW-1 and MW-3 were measured and the wells were visually observed for the presence of product.

TABLE 3D

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
FOURTH QUARTER - JANUARY MONITORING EVENT
Former Griffin Wheel Brass Foundry

Well Number (Location Number)	PAH Analytes[a] (µg/L)				TPH[b] (mg/L)
	Naphthalene	Fluorene	Phenanthrene	Anthracene	
NMW-8 (1789)	<0.48[c]	<0.096	<0.048	<0.048	<0.25
NMW-9 (1790)	<0.50	<0.10	<0.050	<0.050	<0.25
NMW-10 (1791)	<0.47	<0.094	<0.047	<0.047	<0.25
NMW-11 (1792)	<0.48	<0.095	<0.048	<0.048	<0.25
NMW-12 (1793)	<0.47	<0.094	<0.047	<0.047	<0.25
NMW-13 (1794/2003)[d]	<0.47/<0.47	0.56/0.85	0.093/0.16	0.11/0.11	0.49/0.55
NMW-14 (1795)	<0.47	<0.094	<0.047	<0.047	<0.25
Field Blank (3743)	NA[e]	NA	NA	NA	<0.25

Notes:

(a) Groundwater samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8310. Only detected compounds are provided in this table.

(b) Groundwater samples were analyzed for total petroleum hydrocarbons (TPH) by Washington State Method WTPH-D.

(c) "<" denotes analyte was not detected at the indicated detection limit.

(d) A field duplicate sample (location number 2003) was collected at well NMW-13.

(e) NA - not analyzed.

TABLE 4D

COMPARISON OF GROUNDWATER ANALYTICAL RESULTS FOR MONITORING WELL NMW-13
Former Griffin Wheel Brass Foundry

Analytes	Sampling Event				
	September 1992	First Quarter February and March 1993	Second Quarter May 1993	Third Quarter September 1993	Fourth Quarter January 1994
PAH Analytes (µg/L)[a]					
Naphthalene	<0.50[b]	<0.51/<0.51[c]	1.5/1.5[c]	0.99/1.0[c]	<0.47/<0.47[c]
Acenaphthene	<0.50	<0.51/0.84	<0.47/<0.47	<0.47/<0.50	<0.47/<0.47
Fluorene	<0.10	0.27/0.44	0.83/0.90	0.85/0.86	0.56/0.85
Phenanthrene	2.9	0.37/0.16	0.62/0.71	0.69/0.71	0.093/0.16
Anthracene	0.064	0.099/0.085	0.10/0.13	0.10/0.10	0.11/0.11
Fluoranthene	4.3	0.73/0.84	<0.094/<0.094	<0.094/<0.10	<0.094/<0.094
Pyrene	4.0	0.69/0.45	<0.094/<0.094	<0.094/<0.10	<0.094/<0.094
TPH (mg/L)	<1.0[d]	0.7/0.8[e]	0.95/0.86[e]	1.0/0.93[e]	0.49/0.55[e]

Notes:

(a) Groundwater samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8310. Only detected compounds are provided in this table.
(b) "<" denotes analyte was not detected at the indicated detection limit.
(c) A field duplicate sample was collected during this sampling event. The second number in the table represents the sample duplicate analytical result.
(d) The groundwater sample collected during this event was analyzed for total petroleum hydrocarbons (TPH) by Washington State Method WTPH-418.1.
(e) Groundwater samples collected during the first, second, and third quarters were analyzed for TPH by Washington State Method WTPH-D.

Attachment 3

Groundwater Purge and Sample Forms

Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-8A

PROJECT NUMBER: ~~926800~~ 926061.00 PERSONNEL: JAB/JCL

STATIC WATER LEVEL (FT): 32.75 MEASURING POINT DESCRIPTION: TOW

WATER LEVEL MEASUREMENT METHOD: Solinst PURGE METHOD: Dedicated Bladder

TIME START PURGE: 11:54 PURGE DEPTH (FT) 34

TIME END PURGE: 12:17

TIME SAMPLED: 12:20

COMMENTS: No product observed
Raised pump @ 8'

WELL VOLUME CALCULATION (FILL IN BEFORE PURGING)	TOTAL DEPTH (FT)	-	DEPTH TO WATER (FT)	=	WATER COLUMN (FT)	X	MULTIPLIER FOR CASING DIAMETER (IN)			=	CASING VOLUME (GAL)
							(2)	2	6		
	44.0		32.75		11.25		0.16	0.64	1.44		1.8 (5.4)

TIME	11:55	12:01	12:06	12:12	12:15		
VOLUME PURGED (GAL)	0.5	2	3.5	5.0	6.0		
PURGE RATE (GPM)							
TEMPERATURE (°C)	11.6	11.8	11.9	11.9	12.1		
pH	6.71	6.51	6.51	6.54	6.42		
SPECIFIC CONDUCTIVITY (micromhos/cm) (uncorrected)	195	192	189	188	192		
DISSOLVED OXYGEN (mg/L)	—	—	—	—	—		
eH(MV)Pt-AgCl ref.	—	—	—	—	—		
TURBIDITY/COLOR	Light Brn	Light Brn	Light Brn	Light Brn	Clear		
ODOR	None	None	None	None	None		
DEPTH TO WATER DURING PURGE (FT)							
NUMBER OF CASING VOLUMES REMOVED	0	~1	~2	<3	~3		
DEWATERED?	NO →						

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Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-8A

PROJECT NUMBER: 926066.00 PERSONNEL: JAR/JCL

SAMPLE DATA:

TIME SAMPLED: 12:20 COMMENTS:

DEPTH SAMPLED (FT): 34

SAMPLING EQUIPMENT: Dedicated Bladder Pump

SAMPLE NO.	NO. OF CONTAIN-ERS	CON-TAINER TYPE	PRESER-VATIVE	FIELD FILTRA-TION	VOLUME FILLED (ml or L)	TURBIDITY	COLOR	SHIPPED UNDER CHAIN-OF-CUS-TODY AT 4°C?	ANALYSIS REQUEST (METHOD)	COMMENTS
	3	Glass	—	—	1 L	Clear	N/A	Yes	WTPH-D	
	3	Amb Glass	—	—	1 L	Clear	N/A	Yes	PAH	

PURGE WATER DISPOSAL NOTES:

TOTAL DISCHARGE (GAL): 8 COMMENTS:

DISPOSAL METHOD: Drummed

DRUM DESIGNATION(S)/VOLUME PER (GAL):

WELL HEAD CONDITIONS CHECKLIST (CIRCLE YES OR NO - IF NO, ADD COMMENTS):

WELL SECURITY DEVICES OK (BOLLARDS, CHRISTY LID, CASING LID AND LOCK)?: (YES) NO

INSIDE OF WELL HEAD AND OUTER CASING DRY?: (YES) NO

WELL CASING OK?: (YES) NO

COMMENTS:

GENERAL:

WEATHER CONDITIONS: Clear

TEMPERATURE (SPECIFY °C OR °F): 50 °F

PROBLEMS ENCOUNTERED DURING PURGING OR SAMPLING? —

cc: Project Manager:
Job File:
Other:

Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-9A

PROJECT NUMBER: 926066.00 PERSONNEL: JAR/JCL

STATIC WATER LEVEL (FT): 33.53 MEASURING POINT DESCRIPTION: TOM

WATER LEVEL MEASUREMENT METHOD: Solinst PURGE METHOD: Dedicated Bladder Pump

TIME START PURGE: 1245 PURGE DEPTH (FT) 35

TIME END PURGE:

TIME SAMPLED: 1330

COMMENTS: No product observed

Raised pump = 7'

WELL VOLUME CALCULATION (FILL IN BEFORE PURGING)	TOTAL DEPTH (FT)	-	DEPTH TO WATER (FT)	=	WATER COLUMN (FT)	X	MULTIPLIER FOR CASING DIAMETER (IN) 2	4	6	=	CASING VOLUME (GAL)
	44.8		33.53		11.27		0.16	0.64	1.44		7.21 (22)

TIME	~~0~~ 1245	1252	1305	1317	1325	1329	
VOLUME PURGED (GAL)	0	4	10	17	22	25	
PURGE RATE (GPM)							
TEMPERATURE (°C)	12.2	12.4	12.6	12.5	12.2	12.3	
pH	6.28	6.49	6.28	6.24	6.27	6.22	
SPECIFIC CONDUCTIVITY (micromhos/cm) (uncorrected)	349	274	271	271	269	271	
DISSOLVED OXYGEN (mg/L)	—	—	—	—	—	—	
eH(MV)Pt-AgCl ref.	—	—	—	—	—	—	
TURBIDITY/COLOR	Clear	Clear	Clear	Clear	Clear	Clear	
ODOR							
DEPTH TO WATER DURING PURGE (FT)							
NUMBER OF CASING VOLUMES REMOVED		~½	~1½	>2	3	3.4	
DEWATERED?	No					→	

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Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-9A

PROJECT NUMBER: 926066.00 PERSONNEL: JAR/JCL

SAMPLE DATA:

TIME SAMPLED: 1330 COMMENTS: Transfer Blank Taken

DEPTH SAMPLED (FT): 35 Time: 1300

SAMPLING EQUIPMENT: Dedicated Bladder Pump Sample #: 3743 ww

SAMPLE NO.	NO. OF CONTAINERS	CONTAINER TYPE	PRESERVATIVE	FIELD FILTRATION	VOLUME FILLED (ml or L)	TURBIDITY	COLOR	SHIPPED UNDER CHAIN-OF-CUSTODY AT 4°C?	ANALYSIS REQUEST (METHOD)	COMMENTS
	#4	Glass	—	—	1L	Clear	—	YES	WTPH-D	
	#4	Amber	—	—	1L	Clear	—	YES	PAH	

PURGE WATER DISPOSAL NOTES:

TOTAL DISCHARGE (GAL): 25 COMMENTS:

DISPOSAL METHOD: Drummed

DRUM DESIGNATION(S)/VOLUME PER (GAL):

WELL HEAD CONDITIONS CHECKLIST (CIRCLE YES OR NO - IF NO, ADD COMMENTS):

WELL SECURITY DEVICES OK (BOLLARDS, CHRISTY LID, CASING LID AND LOCK)?: (YES) NO

INSIDE OF WELL HEAD AND OUTER CASING DRY?: (YES) NO

WELL CASING OK?: (YES) NO

COMMENTS:

GENERAL:

WEATHER CONDITIONS: Clear - Scattered Clouds Forming

TEMPERATURE (SPECIFY °C OR °F): 45°F

PROBLEMS ENCOUNTERED DURING PURGING OR SAMPLING? —

cc: Project Manager:
Job File:
Other:

Groundwater Purge and Sample Form Date: 1/6/94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-10A

PROJECT NUMBER: 926061.00 PERSONNEL: JCL/JAR

STATIC WATER LEVEL (FT): 33.31 MEASURING POINT DESCRIPTION: TOM

WATER LEVEL MEASUREMENT METHOD: Solonist PURGE METHOD: Dedicated bladder

TIME START PURGE: 1015 PURGE DEPTH (FT) 34

TIME END PURGE: 1038

TIME SAMPLED: 1040

COMMENTS: No product observed

Raised pump ≈ 7½'

WELL VOLUME CALCULATION (FILL IN BEFORE PURGING)	TOTAL DEPTH (FT)	-	DEPTH TO WATER (FT)	=	WATER COLUMN (FT)	X	MULTIPLIER FOR CASING DIAMETER (IN)			=	CASING VOLUME (GAL)
							(2)	2	6		
	44.3		33.31		10.99		0.16	0.64	1.44		1.76 (5.2)

TIME	1017	1018	1023	1027	1032	1038	
VOLUME PURGED (GAL)	<1	0.5	2	3	4.5	5.5	
PURGE RATE (GPM)							
TEMPERATURE (°C)	9.5	11.2	11.4	11.6	11.9	11.9	
pH	6.44	6.21	6.06	6.06	6.24	6.30	
SPECIFIC CONDUCTIVITY (micromhos/cm) (uncorrected)	262	202	201	201	204	201	
DISSOLVED OXYGEN (mg/L)	—	—	—	—	—	—	
eH(MV)Pt-AgCl ref.	—	—	—	—	—	—	
TURBIDITY/COLOR	Light Brown	Medium Brown	Light	Light	Light	Light	
ODOR	None	None	None	None	None	None	
DEPTH TO WATER DURING PURGE (FT)							
NUMBER OF CASING VOLUMES REMOVED	<1	~.3	~1	~2	<3	3	
DEWATERED?	No						

F-43.1 (4-88)

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Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-10A

PROJECT NUMBER: 926061.00 PERSONNEL: JAR/JCL

SAMPLE DATA:

TIME SAMPLED: 1040 COMMENTS:

DEPTH SAMPLED (FT): 34

SAMPLING EQUIPMENT: Dedicated Bladder

SAMPLE NO.	NO. OF CONTAIN-ERS	CON-TAINER TYPE	PRESER-VATIVE	FIELD FILTRA-TION	VOLUME FILLED (ml or L)	TURBIDITY	COLOR	SHIPPED UNDER CHAIN-OF-CUS-TODY AT 4°C?	ANALYSIS REQUEST (METHOD)	COMMENTS
	3	Glass/Amb	—	—	1 L	Light	Brn.	YES	WTPH-D	
	3	Amb/Glass	—	—	1 L	"	"	YES	PAH	

PURGE WATER DISPOSAL NOTES:

TOTAL DISCHARGE (GAL): 7 COMMENTS:

DISPOSAL METHOD: Drummed

DRUM DESIGNATION(S)/VOLUME PER (GAL):

WELL HEAD CONDITIONS CHECKLIST (CIRCLE YES OR NO - IF NO, ADD COMMENTS):

WELL SECURITY DEVICES OK (BOLLARDS, CHRISTY LID, CASING LID AND LOCK)?: (YES) NO

INSIDE OF WELL HEAD AND OUTER CASING DRY?: (YES) NO

WELL CASING OK?: (YES) NO

COMMENTS:

GENERAL:

WEATHER CONDITIONS: Clear

TEMPERATURE (SPECIFY °C OR °F): 42 °F

PROBLEMS ENCOUNTERED DURING PURGING OR SAMPLING? —

cc: Project Manager:
Job File:
Other:

Groundwater Purge and Sample Form Date: 11/6/94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-11A

PROJECT NUMBER: 926061.00 PERSONNEL: JCL/JAR

STATIC WATER LEVEL (FT): 31.83 MEASURING POINT DESCRIPTION: TOM

WATER LEVEL MEASUREMENT METHOD: Solinst PURGE METHOD: Dedicated pump

TIME START PURGE: 11:00 PURGE DEPTH (FT) 33

TIME END PURGE: 11:25

TIME SAMPLED: 11:25

COMMENTS: No product observed

Raised pump ≈ 8'

WELL VOLUME CALCULATION (FILL IN BEFORE PURGING)	TOTAL DEPTH (FT)	-	DEPTH TO WATER (FT)	=	WATER COLUMN (FT)	X	MULTIPLIER FOR CASING DIAMETER (IN) 2 (2)	2	6	=	CASING VOLUME (GAL)
	44.2		31.83		12.37		0.16	0.64	1.44		2.4 (7)

TIME	11:00	11:05	11:11	11:16	11:25		
VOLUME PURGED (GAL)	1	2.5	4	6	7.5		
PURGE RATE (GPM)							
TEMPERATURE (°C)	11.6	12.0	12.0	12.0	12.0		
pH	6.66	6.60	6.63	6.64	6.69		
SPECIFIC CONDUCTIVITY (micromhos/cm) (uncorrected)	567	566	356	563	563		
DISSOLVED OXYGEN (mg/L)	—	—	—	—			
eH(MV)Pt-AgCl ref.	—	—	—	—			
TURBIDITY/COLOR	Medium Turbidity Brown	Medium	Light	Light	Light →		
ODOR	—	—	—	—	—		
DEPTH TO WATER DURING PURGE (FT)					—		
NUMBER OF CASING VOLUMES REMOVED	<1	1	<2	~2.5	3.2		
DEWATERED?	NO →						

F-43.1 (4-88)

ISGO.I

Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-11A

PROJECT NUMBER: 926066.00 PERSONNEL: JAR/JCL

SAMPLE DATA:

TIME SAMPLED: 1125 COMMENTS:

DEPTH SAMPLED (FT): 33

SAMPLING EQUIPMENT: Dedicated Bladder Pump

SAMPLE NO.	NO. OF CONTAIN-ERS	CON-TAINER TYPE	PRESER-VATIVE	FIELD FILTRA-TION	VOLUME FILLED (ml or L)	TURBIDITY	COLOR	SHIPPED UNDER CHAIN-OF-CUS-TODY AT 4°C?	ANALYSIS REQUEST (METHOD)	COMMENTS
	3	Glass	—	—	1 l	Light	Brn	YES	WTPH-D	
	3	Plastic	—	—	1	Light	Brn	YES	PAH	

PURGE WATER DISPOSAL NOTES:

TOTAL DISCHARGE (GAL): 10 COMMENTS:

DISPOSAL METHOD: Drummed

DRUM DESIGNATION(S)/VOLUME PER (GAL):

WELL HEAD CONDITIONS CHECKLIST (CIRCLE YES OR NO - IF NO, ADD COMMENTS):

WELL SECURITY DEVICES OK (BOLLARDS, CHRISTY LID, CASING LID AND LOCK)?: (YES) NO

INSIDE OF WELL HEAD AND OUTER CASING DRY?: (YES) NO

WELL CASING OK?: (YES) NO

COMMENTS:

GENERAL:

WEATHER CONDITIONS: Clear

TEMPERATURE (SPECIFY °C OR °F): 48°F

PROBLEMS ENCOUNTERED DURING PURGING OR SAMPLING? —

cc: Project Manager:
Job File:
Other:

Groundwater Purge and Sample Form Date: 1/6/95 **Kennedy/Jenks Consultants**

PROJECT NAME: Amoco WELL NUMBER: MW-12A

PROJECT NUMBER: 926061.00 PERSONNEL: JCL / JAB

STATIC WATER LEVEL (FT): 32.11 MEASURING POINT DESCRIPTION: TOM

WATER LEVEL MEASUREMENT METHOD: ~~32.11~~ Solonist PURGE METHOD: Dedicated Bladder

TIME START PURGE: 0935 PURGE DEPTH (FT) 33

TIME END PURGE: 0957

TIME SAMPLED: 1005

COMMENTS: Raised pump = 7'
No product observed

WELL VOLUME CALCULATION (FILL IN BEFORE PURGING)	TOTAL DEPTH (FT)	-	DEPTH TO WATER (FT)	=	WATER COLUMN (FT)	X	MULTIPLIER FOR CASING DIAMETER (IN) 2	2	6	=	CASING VOLUME (GAL)
	44.1		32.11		11.99		0.16	0.64	1.44		1.92 (6)

TIME	0937	0940	0945	0950	0954		
VOLUME PURGED (GAL)	1	2	4	5	6		
PURGE RATE (GPM)							
TEMPERATURE (°C)	10.2	10.5	11.4	11.3	11.4		
pH	6.60	6.30	6.00	6.21	6.23		
SPECIFIC CONDUCTIVITY (micromhos/cm) (uncorrected)	263	246	250	250	252		
DISSOLVED OXYGEN (mg/L)	—	—	—	—	—		
eH(MV)Pt-AgCl ref.	—	—	—	—	—		
TURBIDITY/COLOR	Medium Brown	Light	Light	Clear	clear		
ODOR	None						
DEPTH TO WATER DURING PURGE (FT)	[redacted]						
NUMBER OF CASING VOLUMES REMOVED	<1	~1	~2	~2.5	~3		
DEWATERED?	No						

F-43.1 (4-88)

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Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amstad WELL NUMBER: NMW-12A

PROJECT NUMBER: 926061.00 PERSONNEL: JAB/JCL

SAMPLE DATA:

TIME SAMPLED: 10:05 COMMENTS:

DEPTH SAMPLED (FT): 33

SAMPLING EQUIPMENT: Dedicated Bladder

SAMPLE NO.	NO. OF CONTAIN-ERS	CON-TAINER TYPE	PRESER-VATIVE	FIELD FILTRA-TION	VOLUME FILLED (ml or L)	TURBIDITY	COLOR	SHIPPED UNDER CHAIN-OF-CUS-TODY AT 4°C?	ANALYSIS REQUEST (METHOD)	COMMENTS
	3	Glass Amber	—	—	1 L	Clear	N/A	YES	WTPH-D	
	3	Amber	—	—	1 L	Clear	N/A	YES	PAH	

PURGE WATER DISPOSAL NOTES:

TOTAL DISCHARGE (GAL): 9 COMMENTS:

DISPOSAL METHOD: Drummed

DRUM DESIGNATION(S)/VOLUME PER (GAL):

WELL HEAD CONDITIONS CHECKLIST (CIRCLE YES OR NO - IF NO, ADD COMMENTS):

WELL SECURITY DEVICES OK (BOLLARDS, CHRISTY LID, CASING LID AND LOCK)?: (YES) NO

INSIDE OF WELL HEAD AND OUTER CASING DRY?: (YES) NO

WELL CASING OK?: (YES) NO

COMMENTS:

GENERAL:

WEATHER CONDITIONS: Clear

TEMPERATURE (SPECIFY °C OR °F): 38° F

PROBLEMS ENCOUNTERED DURING PURGING OR SAMPLING? —

cc: Project Manager:
Job File:
Other:

Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-13A

PROJECT NUMBER: 926066.00 PERSONNEL: JAB/JCL

STATIC WATER LEVEL (FT): 32.45 MEASURING POINT DESCRIPTION: TOM

WATER LEVEL MEASUREMENT METHOD: ORS PURGE METHOD: Dedicated Bladder Pump

TIME START PURGE: 1354 PURGE DEPTH (FT) 34

TIME END PURGE: 1455

TIME SAMPLED: 1500

COMMENTS: Product observed - used absorbent material to collect product from the well prior to purging. Raised pump ≈ 4'

WELL VOLUME CALCULATION (FILL IN BEFORE PURGING)	TOTAL DEPTH (FT)	-	DEPTH TO WATER (FT)	=	WATER COLUMN (FT)	X	MULTIPLIER FOR CASING DIAMETER (IN) 2	2	6	=	CASING VOLUME (GAL)
	44.1		32.45		11.65		0.16	0.64	1.44		16.78 (SC)

TIME	13:55	1408	1422	1435	1450	1455	
VOLUME PURGED (GAL)	1	12	25	40	50	55	
PURGE RATE (GPM)							
TEMPERATURE (°C)	12.3	12.7	12.9	13.1	12.7	12.8	
pH	6.21	6.11	6.13	6.20	6.23	6.30	
SPECIFIC CONDUCTIVITY (micromhos/cm) (uncorrected)	291	282	277	275	275	278	
DISSOLVED OXYGEN (mg/L)	—	—	—	—	—		
eH(MV)Pt-AgCl ref.	—	—	—	—	—		
TURBIDITY/COLOR	Clear	Clear	Clear	Clear	Clear	Clear	
ODOR	Slight Diesel	Slight Diesel	Slight Diesel	Slight Diesel	~~Slight~~ Faint Diesel	Faint Diesel	
DEPTH TO WATER DURING PURGE (FT)							
NUMBER OF CASING VOLUMES REMOVED	~0	<1	~1.5	~2.5	3	3.3	
DEWATERED?	No	→	→	→	→	→	

Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: 13A

PROJECT NUMBER: 26066.00 PERSONNEL: JAS/JCL

SAMPLE DATA:

TIME SAMPLED: 1500 COMMENTS: Duplicate sample (2003) was collected

DEPTH SAMPLED (FT): 34

SAMPLING EQUIPMENT: Dedicated Bladder

SAMPLE NO.	NO. OF CONTAIN-ERS	CON-TAINER TYPE	PRESER-VATIVE	FIELD FILTRA-TION	VOLUME FILLED (ml or L)	TURBIDITY	COLOR	SHIPPED UNDER CHAIN-OF-CUS-TODY AT 4°C?	ANALYSIS REQUEST (METHOD)	COMMENTS
	6	Glass	—	—	1 L	Clear		YES	VTPH-D	
	6	Amber	—	—	1 L	Clear		YES	PAH	

PURGE WATER DISPOSAL NOTES:

TOTAL DISCHARGE (GAL): 55 COMMENTS:

DISPOSAL METHOD: Drummed

DRUM DESIGNATION(S)/VOLUME PER (GAL):

WELL HEAD CONDITIONS CHECKLIST (CIRCLE YES OR NO - IF NO, ADD COMMENTS):

WELL SECURITY DEVICES OK (BOLLARDS, CHRISTY LID, CASING LID AND LOCK)?: (YES) NO

INSIDE OF WELL HEAD AND OUTER CASING DRY?: (YES) NO

WELL CASING OK?: (YES) NO

COMMENTS:

GENERAL:

WEATHER CONDITIONS: Clear

TEMPERATURE (SPECIFY °C OR °F): 54°F

PROBLEMS ENCOUNTERED DURING PURGING OR SAMPLING?

cc: Project Manager:
Job File:
Other:

Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: AMSTED WELL NUMBER: [illegible]14A

PROJECT NUMBER: 926061.00 PERSONNEL: JCL/JAK

STATIC WATER LEVEL (FT): 29.05 MEASURING POINT DESCRIPTION: Top of Monument (TOC)

WATER LEVEL MEASUREMENT METHOD: PURGE METHOD: Dedicated Bladder

TIME START PURGE: 0845 PURGE DEPTH (FT) 30

TIME END PURGE: 0913

TIME SAMPLED: 0915

COMMENTS: pH Meter calibrated pH 7 = 6.94

raised pump ≈ 10' No product observed

WELL VOLUME CALCULATION (FILL IN BEFORE PURGING)	TOTAL DEPTH (FT)	-	DEPTH TO WATER (FT)	=	WATER COLUMN (FT)	X	MULTIPLIER FOR CASING DIAMETER (IN) 2	2	6	=	CASING VOLUME (GAL)
	~~44.1~~ ~~29.05~~		29.05		15.05		0.16	0.64	1.44		2.41 (7)

TIME	0846	8:53	0900	0907	0910	0913	
VOLUME PURGED (GAL)	#1	3	5	6	7	8	
PURGE RATE (GPM)							
TEMPERATURE (°C)	9.0	8.5	10.8	11.4	11.7	11.8	
pH	6.66	6.66	6.65	6.64	6.65	6.67	
SPECIFIC CONDUCTIVITY (micromhos/cm) (uncorrected)	242	229	227	280	226	226	
DISSOLVED OXYGEN (mg/L)	—	—	—	—	—	—	
eH(MV)Pt-AgCl ref.		—	—	—	—	—	
TURBIDITY/COLOR		Turbid Brown	MEDIUM BROWN	Light →	Light →	Clear	
ODOR		None	→	→	→	—	
DEPTH TO WATER DURING PURGE (FT)		29.05	→	→	→	—	
NUMBER OF CASING VOLUMES REMOVED	<1	1	2	~2.5	~3	—	
DEWATERED?		No	→	→	→	→	

F-43.1 (4-88)

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Groundwater Purge and Sample Form Date: 1-6-94 **Kennedy/Jenks Consultants**

PROJECT NAME: Amsted WELL NUMBER: NMW-14

PROJECT NUMBER: 926061.00 PERSONNEL: JAR/JCL

SAMPLE DATA:

TIME SAMPLED: 0915 COMMENTS:

DEPTH SAMPLED (FT): 30

SAMPLING EQUIPMENT: Dedicated Bladder

SAMPLE NO.	NO. OF CONTAIN-ERS	CON-TAINER TYPE	PRESER-VATIVE	FIELD FILTRA-TION	VOLUME FILLED (ml or L)	TURBIDITY	COLOR	SHIPPED UNDER CHAIN-OF-CUS-TODY AT 4°C?	ANALYSIS REQUEST (METHOD)	COMMENTS
	3	Amber G	—	—	1L	Light	Brn		WTPH-D	
	3	"	—	"	1L	"	"		PAH	

PURGE WATER DISPOSAL NOTES:

TOTAL DISCHARGE (GAL): 60 COMMENTS:

DISPOSAL METHOD: Drummed

DRUM DESIGNATION(S)/VOLUME PER (GAL):

WELL HEAD CONDITIONS CHECKLIST (CIRCLE YES OR NO - IF NO, ADD COMMENTS):

WELL SECURITY DEVICES OK (BOLLARDS, CHRISTY LID, CASING LID AND LOCK)?: (YES) NO

INSIDE OF WELL HEAD AND OUTER CASING DRY?: (YES) NO

WELL CASING OK?: (YES) NO

COMMENTS:

GENERAL:

WEATHER CONDITIONS: Clear

TEMPERATURE (SPECIFY °C OR °F): 35°F

PROBLEMS ENCOUNTERED DURING PURGING OR SAMPLING?

cc: Project Manager:
Job File:
Other: